REMARKS/ARGUMENTS

Applicant responds herein to the Office Action dated April 19, 2005.

Preliminarily, applicant notes with appreciation the Examiner's indication of the withdrawal of the Final Rejection dated November 16, 2004.

Substantively, claims 1, 3, 8 and 11 stand rejected on grounds of obviousness over Chen, et. al. (5,837,058), in view of Moto, et. al. (6,167,194) and Ballance, et. al. (6,395,363). Claims 5 and 12-13 stand rejected on grounds of obviousness over Moto, in view of Chen, in further view of Arai (4,571,486). Claims 6 and 7 stand rejected on grounds of obviousness over Chen, Arai, in further view of Ballance. Lastly, claims 17-19 stand rejected on grounds of obviousness over Moto and Chen, in further view of Lee (6,519,417). Reconsideration is requested in view of amendments of the claims herein (where applicable) and the following remarks.

The invention of currently amended claims 1, 3 and 8 is characterized in that "a tapered surface (or a first tapered surface) annularly encloses the peripheral edge of a flat receiving surface (or a flat bottom surface) for receiving the entirety of a substrate, wherein the gradient of the tapered surface is at least 5° and less than 30°, and the average surface roughness of the tapered surface is not more than 1.6μm."

The primary Chen reference discloses a high temperature susceptor. This reference describes enclosing a substrate holding surface 32 by a beveled side 36 of a lip 34. However, this reference does not describe making the gradient of the beveled side 36 at least 5° and less than 30°, or making the average surface roughness of the beveled side 36 not more than 1.6μm.

Moto, et. al. discloses providing a heating device using halogen lamps with a guard ring for supporting the peripheral edge of a substrate. This reference describes forming a surface 13a having a gradient of 5° on a substrate bearing part 13 of the guard ring 10. In Moto, however, the guard ring 10 is an annular body for only supporting the peripheral edge of a substrate on the tapered surface, and the guard ring 10 inherently does not have a flat receiving surface (or a flat bottom surface) for receiving a substrate. In other words, the guard ring 10 of Moto does not have a tapered surface around a flat receiving surface (or a flat bottom surface) for receiving a substrate. Rather, the circular bearing part for supporting a substrate has a gradient of 5°. Accordingly, Chen and Moto

are essentially different from each other and it is not obvious to a person of ordinary skill in the art to apply the technique disclosed by Moto to the susceptor of Chen.

Further, Moto only teaches providing the substrate bearing part with a gradient of 5°. Accordingly, even if Moto and Chen are combined, it would not have been possible to arrive at the invention of the present application characterized by providing a tapered surface having a gradient of at least 5° and less than 30° to enclose the peripheral edge of a flat receiving surface (or a flat bottom surface) for receiving a substrate.

On the other hand, Ballance discloses an edge ring 134 for supporting an edge portion of a substrate on a sloped surface. This edge ring 134 is essentially similar to the guard ring 10 of Moto. More specifically, the edge ring 134 is also an annular body for only supporting an edge portion of a substrate, not provided with a flat receiving surface (or a flat bottom surface) for receiving a substrate. Further, the edge ring 134 holds the edge portion of a substrate 106 on a sloped surface 200 of an annular shelf 135. Accordingly, Ballance is essentially different from Chen, as well as from Moto, and it is not appropriate or obvious to apply the technique disclosed by Ballance to the susceptor of Chen.

Further, Ballance describes reducing the roughness of the surface 200 to within a predetermined range, thereby reducing its tendency to scratch the substrate 106 (see column 5, lines 51-65). That is, this reference indeed describes reducing the surface roughness of the sloped surface 200. However, it does not describe reducing the surface roughness of an inclined surface surrounding a flat surface for receiving a substrate. Ballance merely teaches reducing the surface roughness of a member which supports the substrate, thereby preventing the substrate from being scratched. Accordingly, the combination of Chen and Ballance, though unrealistic, would only result in a susceptor in which the substrate holding surface 32, not the beveled side 36, has the surface roughness as disclosed by Ballance.

In contrast, the invention of the present application is characterized by supporting a substrate on a flat receiving surface (or a flat bottom surface) and making the surface roughness of a tapered surface annularly enclosing the receiving surface (i.e., a tapered surface inherently not supporting the substrate) not greater than $1.6\mu m$.

Based on the foregoing, the invention of the present application characterized in that "a tapered surface (or a first tapered surface) annularly encloses the peripheral edge of a flat receiving

surface (or a flat bottom surface) for receiving the entirety of a substrate, wherein the gradient of the tapered surface is at least 5° and less than 30°, and the average surface roughness of the tapered surface is not more than 1.6μm"could not be derived from Chen, Moto or Ballance, either considered alone or in any combination thereof.

The invention of claims 5, 12, 17 and 19 of the present application is characterized by "providing a thermal processing apparatus with a susceptor having a tapered surface annularly enclosing the peripheral edge of a flat receiving surface, for irradiating a substrate received on a flat receiving surface with flash light emitted from flash lamps". As disclosed in page 13, line 9 to page 14, linep3 of the specification of the present application, the term "flash lamps", as used therein, is unique in that it is capable of producing extremely intense irradiation energy that is capable of heating the substrate virtually instantaneously, e.g., in a time period from .1 millisecond to 10 milliseconds, to attain a temperature on the order of 1000°C. The unique characteristic of such a thermal processing that utilizes flash lamps is that the surface of the substrate is very abruptly heated and expanded which tends to warp the substrate into a convex shape. When this happens, if an end of the substrate is held by the susceptor, the substrate may crack due to stress received from the susceptor (page 14, lines 18-23 of the specification).

The invention of claims 5, 12, 17 and 19 of the instant application solves such characteristic phenomenon in thermal processing that utilizes flash lamps. More specifically, when the flash light source is actuated and the substrate experiences a sudden and extremely rapid expansion, its peripheral edge is able to ride up the tapered surface, whereby the peripheral edge is freed from being held by the susceptor. As a result, the surface of the substrate is allowed to be expanded freely, which can prevent substrate cracking.

Turning to the references, as described above, Moto teaches providing a heating device using halogen lamps with a guard ring for supporting the peripheral edge of a substrate. The guard ring 10 of Moto does not have a flat surface for receiving a substrate (the unhatched portion 13 shown in Figs. 3, 5 and 6 merely represents an inner peripheral side of the annular surface bearing part 13).

Chen discloses a high temperature susceptor which, however, is intended for CVD applications. Further, Ballance merely discloses providing an RTP apparatus with the edge ring 134 which does not have a flat surface for receiving a substrate. As described in the BACKGROUND

OF THE INVENTION of the instant specification, an RTP apparatus and an apparatus utilizing flash lamps are essentially different from each other. Furthermore, Lee, et. al. is not directed to a thermal processing apparatus of photoirradiation type, but inherently discloses a semiconductor wafer baking apparatus for heating a wafer W by a heating plate 10.

Accordingly, none of the Moto, Chen, Ballance or Lee references relate to an apparatus utilizing flash lamps, but relate to an apparatus for performing thermal processing for an extremely longer time than in an apparatus utilizing flash lamps. Such apparatus for performing thermal processing for a long time does not cause the problem of substrate cracking due to rapid thermal expansion in thermal processing, and either of the references does not mention such problem to be solved.

Turning to Arai, et. al., this reference discloses a thermal processing apparatus that utilizes flash lamps. However, a wafer 6 is held by a mere specimen stage 5, not by a susceptor. Besides, this reference does not mention the problem of substrate cracking due to rapid thermal expansion in thermal processing using a flash lamp.

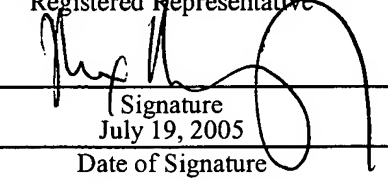
As described above, neither of the references cited by the Examiner either discloses or suggests providing a susceptor with a tapered surface for preventing cracking due to rapid thermal expansion in thermal processing. Therefore, one of ordinary skill in the art would not have been motivated to combine the apparatus of Arai with either of the other references. Accordingly, it would not have been obvious to one of ordinary skill in the art to derive the invention of claims 5, 12, 17 and 19 of the present application from either of these references.

Accordingly, the Examiner is respectfully requested to reconsider the application, allow the claims as amended and pass this case to issue.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 19, 2005:

MAX MOSKOWITZ

Name of applicant, assignee or Registered Representative



Signature

July 19, 2005

Date of Signature

Respectfully submitted,

MAX MOSKOWITZ
Registration No.: 30,576
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700